

The Invention

The invention relates to a foundry binder system, which cures in the presence of gaseous sulfur dioxide and an oxidizing agent. The binder system contains an epoxy resin, an alkyl silicate, and an ester of a fatty acid. The binder system does not contain any ethylenically unsaturated monomer or polymer (e.g. an acrylic monomer or polymer).

Because the binder is acrylate-free, all of the components of the binder can be sold and used in one package. This simplifies the customer's binder storage and handling operations.

It has been found that addition of the alkyl silicate and the fatty acid ester to this acrylate-free binder provides foundry shapes that have enhanced hot strength as measured by erosion resistance and hot tensile strength. The improvements in tensile strength development permit the foundry to use lower binder levels in the core-making process. This is beneficial in the casting of both light metal (e.g. aluminum) and ferrous parts.

The foundry binders are used for making foundry mixes. The foundry mixes are used to make foundry shapes, such as cores and molds, which are used to make metal castings.

DISCUSSION OF EXAMINER'S OFFICE ACTION

Claims 1-11 are rejected under 35 U.S.C. 102 (e) as being anticipated by WOODSON (US 6,604,567)

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102 (e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.13 1.

The prior art of WOODSON discloses composition for foundry cores and molds comprising (claim 1):

20-70 pbw of epoxy resin
5-50 pbw of acrylic monomer¹
1-20 pbw of alkyl silicate effective amount of peroxide.

The epoxy resin of WOODSON is derived from bisphenol A, bisphenol F, epoxidized novolak and mixtures thereof (claim 2). The epoxy resin has epoxide equivalent of 165-200 (col. 3, lines 53-54).

¹Bolded for emphasis.

Additional components of WOODSON include phenolic resin (claim 3) such as phenolic resole (col. 4, line 66). Preferred peroxide is cumene hydroperoxide (claim 7). The specification also discloses use of solvents such as esters of fatty acids in amount of 0-25 pbw (col. 4, lines 40-50).

According to further claims of WOODSON, the components are mixed and introduced to a pattern (claims 9 and 10) to prepare foundry shape (claim 11). Metal article is formed by pouring molten metal into the foundry shape, allowing metal to cool and solidify to form a cast article (claims 12-15).

In the light of the above disclosure, the prior art of WOODSON anticipates claims rejected above.

Applicants' response

Woodson does not anticipate claims 1-9 because claims 1-9 state that the binder composition does not contain any ethylenically unsaturated monomer or polymer. See element (e) of claim 1. Woodson requires the use of 5-50 pbw of acrylic monomer, which is an ethylenically unsaturated monomer. In view of this difference, Applicants' request the withdrawal of the rejection of claims 1-9 based upon 35 U.S.C. §102 (e).

Claim Rejections - 35 USC § 103 (a)

The following is a quotation of 35 U.S.C. §103(a), which forms the basis for all obviousness rejections Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Legal Standard of Obviousness

Graham V. John Deere, 383 U.S. 1, 148 U.S.P.Q. 459 (1966) outlined the approach that must be taken when determining whether an invention is obvious. In *Graham*, the Court stated that a patent may not be obtained if the subject matter would have been obvious at the time the invention was made to a person having ordinary skill in the art, but emphasized that nonobviousness must be determined in the light of inquiry, not quality. Approached in this light, §103 permits, when followed realistically, a more practical test of patentability. In accordance with *Graham*, three inquiries must be made in determining whether an invention is obvious:

- (1) The scope and content of the prior art are to be determined.
- (2) The differences between the prior art and the claims at issue are to be ascertained.
- (3) The level of ordinary skill in the pertinent art resolved.

Against this background, the obviousness or nonobviousness of the subject matter is determined. Secondary considerations, such as commercial success, long felt but unsolved needs, failure of others, etc., can be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

In conjunction with the interpreting 35 U.S.C. §103 under *Graham*, the initial burden is on the Examiner to provide some suggestion of the desirability of doing what the inventor did, i.e. the Examiner must establish a *prima facie* case of obviousness. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention, or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

To establish a *prima facie* case of obviousness, three basic criteria must be met:

1. There must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.
2. There must be a reasonable expectation of success.
3. The prior art reference (or references when combined) must teach or suggest all the claim limitations.

Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over KWASNIOK (DE 19,727,540) in view of TORBUS (US 6,465,542).

Example 4 of the prior art of KWASNIOK discloses a composition comprising:

Epoxy resin in amount of 59.5 pbw
Acrylic monomer in amount of 25.5 pbw²
Ester of fatty acid in amount of 15 pbw
Silane in amount of 0.3 pbw, and
Cumene hydroperoxide in amount 10 pbw.

The composition of KWASNIOK is utilized to make foundry shapes such as cores and molds used in metal casting, wherein fatty acid ester is utilized as a solvent. Specification further enables one to utilize esters of fatty acids in amount of up to 30 pbw.

Epoxy utilized in KWASNIOK, which has been renamed to BAKELITE 164 has epoxide equivalent of 186 -IV- 4 (see attached copy of the website). Specification of KWASNIOK further indicates that mixtures of binders can be utilized as well (page6). One of those binders can be phenolic resin in amount of 5-30 pbw of the total binder.

The difference between the prior art of KWASNIOK and the present invention is presence of alkyl silicate.³

With respect to the above differences the prior art of TORBUS discloses composition for foundry which comprises alkyl silicate as a solvent. According to the specification, alkyl silicates can be utilized with other co-solvents (col. 4) such as monoesters of fatty acids. One example is rapeseed oil methyl ester. The amounts of such solvent can vary. Examples HA 5 disclose use of 5 pbw of silicate.

It is well settled that it is *prima facie* obvious to combine two ingredients, each of which is targeted by the prior art to be useful for the same purpose. *In re Linder* 457 F.2d 506,509, 173 USPQ 356, 359 (CCPA 1972).

In the light of the above disclosure it would have been obvious to one having ordinary skill in the art at the time of the instant invention to utilize alkyl silicate as additional solvent and thereby obtain the claimed invention. Use of fatty acid ester in combination with 5 pbw of alkyl silicate would still provide solvent mixture applicable for use in foundry.

²Bolded for emphasis.

³ Bolded for emphasis.

Applicants' response

The composition of Kwasniok, as do the compositions of Woodson, contains an acrylic monomer. But Applicants' binder, as was stated before, does not contain any ethylenically unsaturated monomer or polymer. Evidently, as the bolded portion of the Examiner's remarks suggests, the Examiner did not recognize this distinction between Applicants' invention and Kwasniok. The Examiner evidently assumed that the only difference between Applicants' composition and the composition of Kwasniok was the presence of an alkyl silicate, which is not the case.

Applicants' assume that if the Examiner had realized that Kwasniok contained an acrylic component, the Examiner would not have concluded that Applicants' compositions were *prima facie* obviousness. But even if the secondary reference, Torbus, suggested using an alkyl silicate in the composition of Kwasniok, the combination of these references would not result in Applicants' binder, which is free of an ethylenically unsaturated monomer or polymer.

Claims 1-9 are rejected under 35 U.S.C. 103 (a) as being unpatentable over KWASNIOK (DE 19,727,450) in view of YOSHIDA (US 5,169,880).

The discussion of the disclosure of the prior art of KWASNIOK from paragraph 6 of this office action is incorporated here by reference.

The difference between the present invention and the disclosure of KWASNIOK is presence of alkyl silicate.

With respect to the above difference, the prior art of YOSHIDA discloses composition for making foundry shapes, which comprises phenolic resin, coupling agent and alkyl silicate. Silicate can be utilized in amount of 0.001-10 pbw (col. 2, line 30-31).

It is well settled that it is *prima facie* obvious to combine two ingredients, each of which is targeted by the prior art to be useful for the same purpose. *In re Linder* 457 F.2d 506,509, 173 USPQ 356, 359 (CCPA 1972).

In the light of the above disclosure it would have been obvious to one having ordinary skill in the art at the time of the instant invention to utilize alkyl silicate as additional solvent and thereby obtain the claimed invention. Use of fatty acid ester in combination with 5 pbw of alkyl silicate would still provide solvent mixture applicable for use in foundry.

Applicants' response

The remarks in connection with the rejection based upon Kwasniok in view of Torbus are just as relevant to this rejection based upon Kwasniok in view of Yoshida. Evidently, the Examiner did not recognize that the composition of Kwasniok contained any acrylic component and Applicants' binder does not. Applicants' assume that if the Examiner had realized that Kwasniok contained an acrylic component, the Examiner would not have concluded that Applicants' compositions were *prima facie* obviousness.

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over KWASNIOK in view of either TORBUS or YOSHIDA as applied to claims 1-9 above, and further in view of ARCHIBALD (US 6,037,389).

The discussion of KWASNIOK and TORBUS or YOSHIDA from paragraph 6 or 7 respectively is incorporated here by reference.

The difference between the present invention and the disclosure of KWASNIOK and TORBUS or YOSHIDA is specific recitation of otherwise known metal casting process.

With respect to the above difference, the prior art of ARCHIBALD discloses epoxy-containing composition for foundry that is utilized in aluminum type metal casting.

According to process of ARCHIBALD, once foundry shape is formed, molten metal is poured into the foundry shape and allowed to cool and solidify resulting in metal casting (claim 8).

The process of metal casting utilizing foundry shapes is well-documented process as it is shown in the prior art applied.

In the light of the above argument, it would have been obvious to one having ordinary skill in the art at the time of the instant invention, that in order to make metal casting using foundry molds and cores one will have to melt such metal first.

Applicants' response

The remarks in connection with the rejection based upon Kwasniok in view of Torbus or Yoshida, and further in view of Archibald, are just as relevant to this rejection based upon Kwasniok in view of Yoshida. Evidently, the Examiner did not recognize that the composition of Kwasniok contained any acrylic component and Applicants' binder does not. Applicants' assume that if the Examiner had realized that Kwasniok contained an acrylic component, the Examiner would not have concluded that Applicants' compositions were *prima facie* obviousness.

Conclusion

In view of the differences between Applicants' invention and the prior art, Applicants submit that claims 1-9 are not anticipated under 35 U.S.C. §102 (e) or obvious under 35 U.S.C. §103 (a).

Furthermore, Applicants submit that their invention could only be derived from the references by the use of "hindsight", i.e. by knowing what Applicants' invention was in advance from Applicants' disclosure, and then *ex post facto* reconstructing Applicants' invention from the prior art after a thorough search. The prior art does not lead TPOSA to Applicants' invention.

In this regard, Applicants believe the discussion in *In re Kotzab*, 55 U.S.P.Q. 2d 1313 (Fed. Cir. 2000) at page 1317, mentioned previously, is relevant:

A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. See *Dembiczak*, 175 F.3d at 999, 50 USPQ2d at 1617. Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher."⁴ *Id.* (quoting *W.L. Gore & Assocs., Inc. v Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303,313 (Fed. Cir. 1983).

⁴ Underlining added for emphasis.

Applicants submit that the application is now in condition for allowance and respectfully request a notice to this effect. If the Examiner believes further explanation of Applicants' position is needed, Applicants' attorney will discuss this matter over the telephone or visit the Examiner personally if this may be useful.

Respectfully submitted,



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